THE PRESENT INVENTION RELATES TO AN AUTOMATIC FIREARM AND IS MORE PARTICULARLY TO A NEW AND IMPROVED AUXILIARY BOLT CLOSURE MECHANISM. THE INVENTION IS DISCLOSED IN THE ATTACHED DRAWINGS AND DESCRIPTION WHICH SHOULD BE CONSIDERED AS PART OF THE INVENTION.

A. The invention relates to an automatic firearm and is more particularly to a new and improved auxiliary bolt closure mechanism useful in automatic firearms of the type having an enclosed reciprocating bolt assembly which must be fully closed in order for the firearm to fire.

B. It is an object of the present invention to provide means for insuring the full and positive closure of the bolt assembly of an automatic firearm despite the failure of such assembly to automatically close in the normal fashion.

C. Another object of the present invention is to provide an auxiliary bolt closure mechanism which contains no external moving component during normal operation of the bolt assembly yet is adapted to be actuated in a facile manner in the event the bolt assembly stalls during its reciprocal movement.

D. A further object of the invention is to provide an externally actuated auxiliary device for incrementally moving the bolt assembly forwardly into a battery position thereby rapidly and positively remediying a stalled condition and facilitating immediate reuse of the firearm.

E. A still further object of the present invention is to provide an automatic firearm possessing an auxiliary bolt closure mechanism which not only positively manipulates the bolt assembly into the battery position but is also provided with means for positively preventing interference with the recoil of the bolt assembly.

F. Still another object of the invention is to provide a novel manually operated bolt closure mechanism for a totally enclosed reciprocating bolt assembly.

G. Other objects will be in part obvious and in part develop from the following detailed description.

H. The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

I. The drawings:

FIG. 1 is a fragmentary side elevational view partially broken away and partially in section, of a firearm containing the auxiliary bolt closure mechanism of the present invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 1 and showing the auxiliary bolt closure mechanism in an engaged position;

FIG. 3 is an enlarged sectional view similar to FIG. 2 showing the closure mechanism in a retracted position; and

FIG. 4 is a transverse sectional view taken along the line 4—4 of FIG. 3.

Referring now to the drawings in detail, wherein like referenced characters indicate like parts throughout the several figures, FIG. 1 shows an automatic firearm 10 of the gas-operated type. The firearm 10 comprises a receiver 12 defining in the upper longitudinal portion thereof a chamber 14 for receiving a bolt assembly. The rear of chamber 14 communicates with a receiver extension 16 located in stock 18. Operatively connected forwardly of chamber 14 is a barrel 20 having near the forward end thereof a gas port 22 through which a portion of the expanding gas developed on firing the gun passes in order to actuate the automatic recoil, causing ejection of the spent cartridge shell and subsequent successive chambering of the cartridges 24 located in cartridge magazine 26. Immediately below longitudinal chamber 14 of receiver 12 and communicating therewith is a second chamber 28 housing the trigger mechanism 30. The receiver further possesses adjacent to the chamber 28 a hand-grip 32 facilitating the manipulation of the trigger mechanism 30.

The trigger mechanism is generally similar in design and operation to the mechanism described in the U.S. Patent No. 3,045,555 issued July 24, 1962, to E. M. Stoner and includes a trigger 34 pivotally mounted on trigger pin 36 and possessing a forward trigger sear 38 which cooperates with the lower notch 40 of the hammer 42 to retain the hammer in a cocked position. Upon pivotal movement rearwardly of the trigger 34, the trigger sear 38 is dislodged from notch 40 permitting the hammer 42 to pivot under the bias of a hammer spring 46. The hammer swings rearwardly into the chamber 14 housing the bolt assembly, generally designated 48, and passes through the bottom longitudinal aperture 50 in the bolt carrier 52 so as to strike the firing pin 54 thereby firing the cartridge 24 located within the firing chamber 56 of the barrel 20.

Upon recoil of the bolt assembly 48 the trigger 34 is caused to move rearwardly against the bias of its hammer spring 46 and, while the trigger is pulled, is retained in a cocked position either by the cooperation of intermediate hammer notch 58 and hook seal 60 of disconnect 62 or by automatic hammer notch 64 and automatic sear 66, depending upon the setting of the control cam 68, as more fully described in the aforementioned Stoner patent.

The reciprocating bolt assembly 48 includes a generally cylindrical bolt carrier 52 adapted for nonrotational longitudinal movement within chamber 14 of receiver 12 and a bolt 70 mounted within the carrier 52 for limited longitudinal and rotational movement relative thereto. On the forward end of bolt 70 are provided bolt lugs 72 which cooperate with the inwardly protruding flanges 74 to hold the bolt in the battery position and thereby lock the breech against the pressure of firing.

Upon firing the weapon as described hereinbefore, the bullet passes outwardly through the barrel 20 under the impetus of the expanding powder gases. A portion of these gases upon reaching the gas port 22 pass therein through and into the gas passage tube 78 connecting the port 22 with the mating port 80 located within the bolt carrier key 82. The mating port 80 connects with an annular chamber 84 defined by the bolt 70 and the bolt carrier 52. As more fully set forth in E. M. Stoner's U.S. Patent No. 2,951,424 issued September 6, 1960, the chamber 84 fills with high-pressure exhaust gas, driving the bolt carrier 52 rearwardly within the chamber 14, and initially causing the annular shoulder 86 of carrier 52 to contact the flange 88 of the firing pin 54 while at the same time, by virtue of the lost motion connection between carrier 52 and bolt 70, causing the bolt cam pin 90 to travel in the helical slot 92 cut in bolt carrier 52. The movement of cam pin 90 within helical slot 92 causes relative rotation between the bolt 70 and the bolt carrier 52, the latter being held against rotation by the cooperation of carrier key 82 with the longitudinal groove 94 of receiver 12.

The rotation of bolt 70 results in the registry of bolt lugs 72 and the slots between the inwardly protruding lugs 74 on the breech end of the barrel thereby permitting rearward movement of the bolt and bolt carrier upon continuing recoil of the carrier. The rearward momentum of the recoiling bolt assembly is absorbed by
the compression of recoil spring 96 which upon dissipation of the rearward momentum, acts upon the bolt assembly 48 to return it to the locked battery position. During the recoiling operation the expended cartridge shell is, of course, ejected and a new cartridge is fed from the magazine 26 into the firing chamber 56.

As will be appreciated, it is essential that the bolt 70 be fully closed and locked in order for the gun to fire. If the bolt is moved up to battery position, but is not rotated by the forward movement of the bolt carrier 52 so that the bolt lugs 72 and the depending lugs 74 connect to lock the bolt in the breech, then the firing pin 116 will be held by the annular shoulder 86 in a retracted, nonactuatable position. Such a stallng of the bolt carrier at some point in its travel with the subsequent failure of the bolt to lock may result from various causes, such as the presence of dirt within the chamber 14 or by a distorted cartridge. It is essential that such field difficulties be quickly remedied so that the operator can positively close the bolt, permitting a quick renewal of the normal operation of the firearm.

According to the present invention, this may be accomplished in a facile manner by actuating the auxiliary manually operated bolt closure mechanism generally designated 98. The mechanism 98 is slidably received within the generally cylindrical side passage 100 of the receiver 12. The passage 100 extends outwardly and rearwardly from the chamber 14 and in communication relationship thereto. The passage 100 is shown as being disposed at an angle of approximately 20° to the axis of reciprocation of the bolt assembly 48.

It will be appreciated that no substantial opening should be present on the closed receiver chamber 14 through which foreign matter may enter the interior of the firearm. In the embodiment chosen for illustrative purposes, this is effectuated by providing the passage 100 in receiver 12 with a counterbore 102 at its external end. Slidable within the counterbore 102 is the shank 104 of external actuating knob 106 which is quite close fitting yet is provided with sufficient clearance to prevent binding during its manipulation. The knob 106 additionally exhibits a serrated finger-contortion portion 108, best shown in FIG. 1, which provides a firm and sure contact with the mechanism during the actuation thereof.

During normal use of the firearm, the mechanism 98 is retained in a retracted noninterfering position by means of the helical spring 110 which abuts outwardly facing annular shoulder 112 of passage 100 and is maintained in only a slightly compressed condition. Received within the recess of knob 106 as well as within the spring 110 and fixedly attached to the knob by means of pin 114 is a plunger, generally designated 116, which constitutes an extension of knob 106 within the passage 100 inwardly beyond the shoulder 112. As best seen in FIGS. 3 and 4, the plunger 116 is generally cylindrical and possesses a longitudinal recess 118 along one side thereof of defining at its forward end a shoulder 120 which cooperates with cross pin 122 to maintain the closure mechanism 98 within the passage 100 against the outward bias of slightly compressed helical spring 110. The cross pin 122 is maintained in a fixed position within the arcuate slot 124 of receiver 12 and extends into the recess 118 thereby permitting the inward slideable movement of the plunger and knob assembly. The forward end of plunger 116 containing shoulder 120 is partitioned by bifurcating slot 126 which extends rearwardly from the forward end and communicates with recess 118 along a substantial portion of its length. The slot 126 generally conforms to the cross-sectional configuration of paw 128 which is pivotally mounted within the slot 128 by means of pivot pin 130.

Pawl 128 comprises a generally rectangular pawl body portion 132 possessing at its rearward extremity a slightly tapering rear surface 134 and a transverse aperture 136 through which extends the pivot pin 130. As shown, the aperture 136 is generally parallel to rear surface 134. On the forward end of body portion 132 is a ratchet contacting and actuating foot 138 which cooperates with the longitudinally spaced ratchet teeth 140 located on the side of bolt carrier 52 so as to move the bolt assembly 48 into the battery position. The teeth 140 extend along the length of carrier 52 a sufficient amount so that they are presented to the passage 100 regardless of the position of the carrier 52. Outstanding from pawl body portion 132 is an integral rib portion 142 possessing a rearwardly facing cam surface 144 which cooperates with the cross pin 122 to move the foot 138 out of contact with teeth 140 when the bolt closure mechanism 98 is moved into a retracted position under the bias of spring 110.

Plunger 116 additionally provides an aperture 146 which extends rearwardly from slot 126 and in which is positioned the pawl engaging rod 148 which is biased by compressed spring 150 into intimate physical contact with the rear surface 134 of pawl body portion 132 so as to cause the pawl to pivot about pivot pin 130 when permitted to do so by the movement of the closure mechanism inwardly.

It will be appreciated that the auxiliary bolt closure mechanism 98 generally is maintained in the retracted position during normal operations. However, in the event the bolt carrier becomes stalled the operator merely compresses for force the knob 106 thereby causing the entire bolt closure mechanism 98 to move forward against the bias of the helical spring 110. The foot 138 of pawl 136, which has been held out of engagement with the bolt carrier by means of cross pin 122 while the mechanism is in the retracted position, is released as the mechanism moves inwardly and, under the pressure of spring 150 acting through rod 148, pivots to engage the teeth 140 of the bolt carrier 52. Continued inward pressure on the knob 106 is then transmitted through the mechanism to the bolt assembly thereby forcing the bolt carrier 52 forward so as to place the bolt assembly in the battery position. Since the bolt carrier teeth 140 extend for the full length of the carrier movement, it will be appreciated that engagement therewith by the pawl foot 138 can occur at any position of the bolt carrier travel.

Generally the obstruction to the movement of bolt carrier 52 is rather slight and can be overcome by the aforesaid procedure, after which it is possible for the recoil spring 96 to act in its normal manner and force the bolt carrier 52 forwardly into the locked battery position. As will be appreciated, even though the closure mechanism is held in the engaging position, the pawl foot 138 will not interfere with the continued forward movement of the carrier 52 since it is spring-biased by the pawl engaging rod 148. Consequently, the bolt carrier 52 is capable of moving forward without damage to either the carrier or to the pawl foot 138.

In the event the initial movement of the closure mechanism 98 fails to overcome the obstruction causing the stall of bolt carrier 52, the knob 106 may be released causing a rearward movement of the closure mechanism into its retracted position. The knob may then again be pressed forwardly by successive operations to "inch" the bolt mechanism into the locked battery position. It is a further advantage of the present invention that should the gun be fired when the mechanism 98 is in an engaged position, the rearward movement of bolt carrier 52 during its recoil will cause the cross pin 122 to act against the cam surface 144 moving the foot 138 out of engagement with the bolt carrier teeth 140 thereby permitting the bolt carrier 52 to continue the recoil operation in the normal manner. Additionally, the present invention permits visual inspection to ensure that the closure mechanism is retracted.

As can be appreciated from the foregoing description,
the present invention provides a manually operated auxiliary closure device associated with an automatic weapon which facilitates unplugging and positive closure of a totally enclosed bolt assembly in order to permit the firing of the weapon. This device contains under normal operating conditions no externally moving part which might become fouled with clothing or other objects while the weapon is being fired. More particularly, the mechanism closely fits into the receiver of the weapon thereby maintaining the interior thereof in a condition which is substantially free from foreign matter.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a gas-operated automatic firearm, a receiver having a longitudinal cavity and a passage communicating with the cavity, said passage extending rearwardly at an acute angle to the longitudinal axis of the cavity; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions, said assembly comprising a bolt carrier; and an auxiliary bolt closure mechanism slideably retained within said passage for moving the bolt carrier and comprising a pivotally mounted pawl urged into engagement with the ratchet teeth of said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

2. In a gas-operated automatic firearm, a receiver having a longitudinal cavity and a transverse passage communicating with the cavity, said passage extending rearwardly at an acute angle to the longitudinal axis of the cavity; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions, said assembly comprising a bolt carrier having on its outer surface adjacent said passage means for assisting the longitudinal movement thereof within the cavity; and an auxiliary bolt closure mechanism slideably retained within said passage for inward and outward movement, said closure mechanism being biased outwardly and comprising a motion-transmitting member resiliently urged into cooperative engagement with said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

3. In a gas-operated automatic firearm, a receiver having a longitudinal cavity and a passage communicating with the cavity, said passage extending rearwardly at an acute angle to the longitudinal axis of the cavity; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions, said assembly comprising a bolt carrier having on its outer surface adjacent said passage means for assisting the longitudinal movement thereof within the cavity; and an auxiliary bolt closure mechanism slideably retained within said passage for inward and outward movement, said closure mechanism being biased outwardly and comprising a motion-transmitting member resiliently urged into cooperative engagement with the movement assisting means on said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

4. In a gas-operated automatic firearm, a receiver having a longitudinal cavity and a transverse passage communicating with the cavity, said passage extending rearwardly at an acute angle to the longitudinal axis of the cavity; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions, said assembly comprising a bolt carrier having adjacent said passage means for assisting the longitudinal movement thereof within the cavity; and an auxiliary bolt closure mechanism slideably retained within said passage for inward and outward movement, said closure mechanism being biased outwardly and comprising a pivotally mounted pawl urged into engagement with the ratchet teeth of said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

5. In an automatic firearm, a receiver having a longitudinal cavity and a transverse side passage communicating with the cavity, said side passage extending outwardly and rearwardly at an acute angle to the cavity; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions; a recoil spring rearwardly of said assembly for urging said assembly into the battery position; said assembly comprising a bolt carrier having along the side adjacent said passage means for assisting the longitudinal movement thereof within the cavity; and an externally actuated auxiliary bolt closure mechanism slideably retained within said passage for inward and outward movement, said closure assembly being biased outwardly and comprising a motion-transmitting member urged into cooperative engagement with the ratchet teeth of said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

6. In a gas-operated firearm, a receiver having a longitudinal cavity and a transverse side passage communicating with the cavity, said side passage extending outwardly and rearwardly at an acute angle to the cavity and having a counterbore at the outer end to provide an outwardly facing annular shoulder intermediate the ends thereof; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions; a recoil spring rearwardly of said assembly adapted to be under compression when said assembly is in the retracted position and to bias said assembly into the battery position; said assembly comprising a bolt carrier having along the side adjacent said passage means for assisting the longitudinal movement thereof within the cavity; and an externally actuated auxiliary bolt closure mechanism slideably retained within said passage for inward and outward movement, said closure mechanism comprising a spring seated on the shoulder within the passage of the receiver for outwardly biasing said mechanism, a pivotally mounted pawl resiliently urged into engagement with the ratchet teeth of said bolt carrier during inward movement of said closure mechanism thereby facilitating movement of said carrier into the battery position.

7. In a gas-operated automatic firearm, a receiver having a longitudinal cavity and a generally cylindrical side passage communicating with the cavity, said side passage extending outwardly and rearwardly at an acute angle to the cavity and having a counterbore at the outer end to provide an outwardly facing annular shoulder intermediate the ends thereof; a bolt assembly mounted in said cavity for reciprocable movement between retracted and battery positions; a recoil spring rearwardly of said assembly adapted to be under compression when said assembly is in the retracted position and to bias said assembly into the battery position; said assembly comprising a bolt carrier having along the side adjacent said passage means for biasing the pawl into functioning contact with the ratchet teeth on the bolt carrier; and plunger retaining means fixedly positioned in said receiver and cooperating with the shoulder of said plunger to limit outward movement of the mechanism, said retaining means being adapted to operate against
3,236,155 7 said cam surface to move said pawl out of contact with said bolt carrier teeth upon outward movement of said plunger.

8. An auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism being communicatively and angularly disposed relative to the bolt assembly for slideable inward and outward movement and comprising outwardly biased actuating means adapted for external manipulation, and motion-transmitting means mounted on said actuating means for movement into and out of contact with the bolt assembly whereby the assembly is incrementally urged toward the battery position.

9. An auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism being communicatively disposed at an acute angle relative to the bolt assembly for slideable inward and outward movement and comprising outwardly biased actuating means adapted for external manipulation, and motion-transmitting means pivotally mounted on said actuating means and having cam means facilitating the biasing thereof into and out of contact with the bolt assembly whereby the assembly is urged by increments into the battery position.

10. An auxiliary bolt closure mechanism for use in a gas-operated firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism extending angularly outwardly from the bolt assembly and comprising an outwardly biased externally actuated plunger member, and a pawl member pivotally mounted on the plunger member for movement into and out of contact with the bolt assembly whereby the assembly is moved into the battery position.

11. An auxiliary bolt closure mechanism for use in an automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism extending outwardly and rearwardly from the assembly and comprising an outwardly biased plunger adapted for external manipulation and having means for limiting outward movement thereof; a pawl pivotally mounted on said plunger; and pawl actuating means for biasing the pawl into functioning contact with the bolt assembly, said pawl having cam means for moving the pawl out of contact with said assembly upon outward movement of said plunger.

12. An auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism extending outwardly and rearwardly from the assembly and an outwardly biased plunger adapted for external manipulation and having means limiting outward movement thereof, said plunger being bifurcated at the forward end; a pawl pivotally mounted within the bifurcating slot and having a cam surface adjacent the edge thereof; and pawl actuating means for biasing the pawl into functioning contact with the bolt assembly, said cam surface adapted to move said pawl out of contact with said assembly upon outward movement of said plunger.

13. A manually operated auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism extending outwardly and rearwardly from the assembly and comprising an outwardly biased plunger having a shoulder on a forward bifurcated end thereof; a pawl pivotally mounted within the bifurcating slot and having a cam surface adjacent said shoulder; pawl actuating means for biasing the pawl into functioning contact with the bolt assembly; and a plunger retaining means cooperating with said shoulder to limit outward movement of the mechanism and adapted to operate against said cam surface to thereby move said plunger out of contact with said assembly upon outward movement of said plunger.

14. An auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism extending outwardly and rearwardly from the assembly and comprising biasing means abutting a portion of the receiver for urging the mechanism outwardly; a plunger having a longitudinal side recess defining a shoulder on a forward bifurcated end thereof, the bifurcating slot communicating with said longitudinal recess and passing through said shoulder; a pawl pivotally mounted within the bifurcating slot and having a cam surface contiguous to said recess; a pawl actuating rod resiliently mounted within the plunger for moving the pawl into contact with the plunger assembly; and retaining means fixedly positioned in said receiver and extending into said recess, said retaining means cooperating with said shoulder for limiting the outward movement of the mechanism and with said cam surface to move said pawl out of contact with said assembly upon outward movement of said plunger.

15. A manually operated auxiliary bolt closure mechanism for use in a gas-operated automatic firearm having a receiver and a bolt assembly enclosedly mounted within the receiver for movement between retracted and battery positions, said closure mechanism being substantially within the receiver but extending outwardly and rearwardly from the assembly and comprising an actuating knob projecting from the receiver and having a shank portion slideably received in close interfitting relationship within the receiver; a spring abutting a portion of the receiver and said knob for biasing the mechanism outwardly; a plunger fixedly connected to said knob and having a longitudinal side recess defining a shoulder on a forward bifurcated end thereof for limiting outward movement of the mechanism, the bifurcating slot communicating with said longitudinal recess and passing through said shoulder; a pawl pivotally mounted within the bifurcating slot and having a cam surface contiguous to said recess; a pawl actuating rod resiliently mounted within the plunger for moving the pawl into contact with the bolt assembly; and a plunger retaining means fixedly positioned in said receiver and extending into said recess, said retaining means cooperating with said shoulder for limiting the outward movement of the mechanism and with said cam surface to move said pawl out of contact with said assembly upon outward movement of said plunger.

No references cited.

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